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SECTION OF BIOLOGY*

JANUARY 14, 1946

DOCTOR ROSCOE R. SPENCER, Chief, National Cancer Institute, Washington, D. C.: *Carcinogenesis and Cell Adaptations.* (This lecture was illustrated by lantern slides.)

During the past five years, studies have been made of the action of carcinogenic agents upon free-living single-cell species, based upon the theory that the process we call carcinogenesis and the process by which such organisms become adapted to unfavorable environments may have certain features in common.

Essentially three concepts are involved in this theory:

1. That the cancer process is, in part, at least a *special type* of cellular adaptation to various unusual environments. Not all cell adaptations end in cancer. Reptiles and amphibians rarely respond to carcinogenic agents. Wooley, Fekete, and Little[1] have shown that cancer of the adrenal cortex may be induced by removal of the ovaries and testicles of new born mice of the Ce strain, but not in other inbred strains.

* No meeting was held in January by the Section of Geology and Mineralogy.
[1] Science **97**: 291. 1943.

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2. That the transformation of a normal cell to a cancer cell involves a step-like process. There is no clinical or experimental evidence to support the assumption that the genesis of a cancer cell involves a sudden change in a normal cell. On the other hand, the clinically observed association of cancer with chronic irritation; the various precancerous lesions and stages; the prolonged incubation period in all experimentally induced cancers; and such fundamental observations as Earl's[2] *in vitro* transformation of a single clump of normal cells to cancers of six or seven different types of behavior, all seem to fit in with the concept of *gradualism* in the genesis of cancer.

3. That the cancer process is basically a survival mechanism. It has been pointed out that the universal goal of living things is survival, but the survival of the cancer cell is a thing apart from the survival of the organism as a whole.

The successful immunization of individual animals to multiple lethal doses of various toxins is well known, and can be achieved best by means of interval injections of increasing doses over a considerable period. Naturally, one suspects that the permanent and successful adaptation of a race or species, in contrast to the adjustment of the individual cell or organism, would require a much longer time. However, it is believed that the underlying biochemical mechanism of species adaptation must, of necessity, be basically similar to the mechanism of adjustment of an individual organism.

A cancer cell is conceived of as a descendent of a normal cell that has gradually adjusted successfully over many cell division cycles or generations to an unfavorable environment. The adjustment is successful from the frame of reference of the cell. It is unsuccessful from the frame of reference of the organism as a whole, since the cancer cell becomes parasitic upon its host.

Our studies have yielded results which have suggested that there are several important principles involved in the mechanism by which cells become adapted to unfavorable environment.

Experimental data were presented by means of lantern slides which support the following tentative principles:

1. The *continuous* exposure of actively multiplying, free-living, bacterial species to an unfavorable environment may not be fatal to

[2] J. Nat. Cancer Inst. 4: 131 *et seq.* October, 1943.

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individual organisms or cultures for a number of generations or cell-division cycles, but in due time, the species will die.

2. By discontinuous or alternating exposure, an actively multiplying species can adapt and continue to survive in an environment that is fatal when the exposure is continuous.

3. The ability of an organism to resist an unfavorable environment is a function of its age or maturity.

4. Organisms can resist higher intensities of an unfavorable environment during the resting stage than during the actively multiplying stage.

The belief is expressed that a continuation of these studies will lead to a better understanding of the underlying principles and mechanism concerned in species adaptation.

SECTION OF PSYCHOLOGY

JANUARY 21, 1946

DOCTOR T. C. SCHNEIRLA, Associate Professor of Psychology, Washington Square College of Arts and Science, New York University; Associate Curator, Dept. of Animal Behavior, American Museum of Natural History, New York, N. Y.: *Ants and Men: Problems in the Bio-Psychology of Social Organization.* (This lecture was illustrated by lantern slides.)

(An abstract of this paper will be published in a later issue of the TRANSACTIONS.)

SECTION OF ANTHROPOLOGY

JANUARY 28, 1946

DOCTOR EARL W. COUNT, New York, N. Y.: *The Evolution of the Race Idea in Modern Western Culture during the Period of the Pre-Darwinian Nineteenth Century.*

I.

For several centuries, we of European stock have been adjusting ourselves to the fact that the world is round and that there are humans on the other side of it. This does not mean that, until Columbus discovered America, we had no notion of other racial types. We have long been used to the idea that there were two kinds of people,—Christians and heathen, with the Jews constituting some kind of *tertium quid*. Ethiopians, black Pygmies, dark Easterners, sallow horsemen out of the steppes, were regarded sometimes as curiosities, sometimes as highly undesirable intruders. The less they resembled ourselves or acted like us, the longer it took us to recognize them as belonging to the human species.

However, when we began to explore the whole world and seize possession of it, a readjustment was necessary. In the beginning, circumstances required that the rest of mankind adjust itself to us; but, as a great secular wave of history recedes today, it is we who are compelled to adjust ourselves to the rest of mankind.

The history of the concept of race belongs to the intellectual side of that adjustment. The concept belongs to science. Now, science is a phenomenon peculiar to European culture in recent centuries. While the sciences may be pursued by their specialists severally, any study of the entity of *science* reveals it as an organ within the body of our culture, having its own physiology and participating in that of the whole body—both affecting that body and being affected by it.

However, before we probe further, let us take note of two things. One is the phenomenon of *culture lag* within science. Stated in epigram—Newton has been more important to biology than Darwin has been to physics. Since the Renaissance, we have inverted our strategy of exploring the universe; so that, instead of starting with man and

fitting the universe to him, we have been trying to do the opposite. Hence, what the physicist finds at the close of the seventeenth century may take another century and a half to permeate biological thinking.[1] I must hasten to add that this is meant as a description of a historical happening, and not as a statement of law. If it actually represents a law, then that is something still to be verified.

The other preliminary observation applies to a certain difference which apparently inheres between the physical sciences, on the one hand, and the biological on the other, and, still more obviously, between the biological and the social sciences. Physical science is what I shall call—I hope I am not thereby misunderstood—a "leader" science, while biological and social sciences are "follower" sciences. That is, physical science can possess a certain detachment which the others cannot. It explores an infinite universe and its findings, which do not depend upon human events, modify human activity. Thus, the discovery of a physical law can, for instance, eventually alter the material basis of living and also affect the attitude of the average man towards the universe. Biological science, on the other hand, deals with only a small part of the universe. Furthermore, it is to a considerable degree based on physics and chemistry. The converse of this, however, is not true. We narrow our field even further when at last we reach the social sciences; for, in spite of ants, wasps, termites, and *Rhesus* troops, the social sciences obtain their material essentially from the events of man only.

It is necessary to consider these things, because they have greatly influenced the evolution of race concept. Let us return to the position that raciology is the result of our Occidental culture endeavoring to adjust itself, one way or another, to the fact of the human species. It was the events of human history that compelled some sort of adjustment. We must expect, therefore, that raciology, as we conceive it, was engendered by the heat of natural aspirations in a way unknown to the physical sciences. It is possible, for instance, to consider almost the entire nineteenth century as one era of classical physics, starting with Count Rumford's heat experiments (1798) and ending in 1896, when Roentgen discovered X-rays and Becquerel, radioactivity. How-

[1] In the mid-eighteenth century, Lagrange created the calculus of variations. At the present time, this powerful tool, which would be invaluable to the metrics of man, is still practically unapplied in physical anthropology.

ever, this[2] we cannot do with raciology. It moves *with* history. The Napoleonic epoch brings to a close the era of the philosophers in science. Europe then enters upon a reactionary period and a rapid evolution of nationalism which profoundly influence the science of race. The first half of the nineteenth century is one of gestation in biological thought. Then, in mid-century, comes the explosion of Darwinism,[3] simultaneously with a climax in political life. At this time, anthropology is born. Its gestation has been conducted jointly by the life of general biology and of social history. Soon we shall find that even *social* history has affected the concept of *biological* race.

Apropos of social history as a factor—we quite understand that it has been responsible for *racism*. Racism is a product of nineteenth-century nationalism, although its antecedents are older. But raciology, too, the actual *bona fide* science, has been promoted and enriched by the developing self-consciousness among those culture-units of Europe, called nations. Let us distinguish carefully. Raciology is part of the honest attempt of scientific anthropology to understand man. Racism is a prostitution of race facts, plus a marshalling of pseudo-facts, fancies, and prejudices, to promote nationalism along pathological channels. Therefore, I shall do no more than mention, at this time, the *cults* of Indo-Germanism, Aryanism, and the "Pan-" movements, such as Pan-Germanism, Pan-Slavism, Pan-Turanianism, Pan-Hellenism, etc. In a comprehensive history of race thought, they have their place; for the pathologies of science are real and part of its case-history.

This brings us to the second great adjustment European man has been making to man; but this is an adjustment to himself primarily, not to world-wide man. Eventually, to be sure, the two adjustments must be enmeshed; but we need not complicate the story with this phase. After the fall of Napoleon, the European nations enter upon an unprecedented self-appraisal. They reach down into the bases of their composition. So they discover, among a number of other things, that they are a mixture of "races." Hereby, the word "race" is seen

[2] This again was a historical observation, and not a generalization, in the nature of a law. The great social events of the nineteenth century—for instance, the American Civil War—do not force physics into some hyper-activity, as the Second World War could do. The inventions of the nineteenth century, so necessary to the efflorescence of technology, did not wait upon the physicist as they now have to do. Nor was technology, then, the cultural giant that it is today. In other words, technology had not progressed as far in capturing physics as it has today. Since, therefore, technology is both a creator of cultural events and is much stimulated by cultural events, such as war, physics may yet end up by riding the waves and troughs quite as inescapably as anthropology. But, if and when this happens, it will not mean at all the same thing about the "soul" of physics that it will about that of anthropology.

[3] Darwin's hypothesis was forced out of him reluctantly, by the pressure of a cultural movement.

to take on a second meaning, one which leads eventually to much confusion. Obviously, I cannot be using the word on the same scale, when I speak of "Alpines" and "Mediterraneans," as when I speak of "Negroes" and "Mongoloids."

Let us divide the history of raciology into the following eras:

1. The eighteenth century, ending with the Napoleonic interlude;
2. The pre-Darwinian period, from the fall of Napoleon to about 1860;
3. The post-Darwinian period, from 1860 to the First World War;
4. The twentieth century, since the First World War.

For brevity's sake, we shall not go back to the eighteenth century, except incidentally; and, of the four periods, only the second—the "gestation" period—will be developed. The last two will only be mentioned. As a further limitation, we shall concern ourselves mainly with France, England, and Germany. For, with due acknowledgment of the greatness of other nations, these three lead Europe, at least in the *bulk* of nineteenth-century thought. If France, in our discussion, seems to receive more attention than the other two leaders, it is because, in the particular subject and period that we are dealing with, she is receiving her due.

II.

In preparation for the period we are to examine more closely, the least that we can say of the eighteenth century is this: It was what Merz has called the century of philosophy, as the sixteenth was that of the Reformation, the fifteenth that of the Renaissance, and the nineteenth that of science.[4] I think you will agree that it was the great breeder of ideas. It was molded, either posthumously or contemporaneously, by Newton, Leibniz, Spinosa, Johann Sebastian Bach, Handel, Haydn, Montesquieu, Diderot, the Encyclopedists, Voltaire. Its highest achievement in thought is probably Kant's "Critique of Pure Reason." The century was Deistic. It sought a rational universe into which rational man could fit. Linneus's orderly arrangement of animals, plants, and minerals must be understood from this

[4] *A History of European Thought in the Nineteenth Century.* Vol. I.

standpoint. It is the naturalist's version of the philosopher Leibniz's gradation of all animate entities which he led from the lowest life, through man, to God. It is entirely fitting, in fact, that the greatest thinker of the century, Immanuel Kant, should at once have been the author of the "Critique;" have anticipated, by about forty years, Laplace's nebular hypothesis of the origin of the solar system; and have propounded the most advanced theory of his century and of many years thereafter concerning the origin and diversification of human races. The eighteenth century produced the ingredients which the nineteenth developed and worked over in its efforts to account for the races of man: the significance of heredity, of environment, of geography; the biological foundations of human culture; the anatomy and physiology of man, and their position with respect to homologous phenomena in animal life in general; diversification of races; hybridization; statistics, and population pressure. We can say that it sowed the seeds of evolutionary doctrine, in the sense that some of its thinkers broke away from the conceit of immutable creations and came to surmise transformation of bodily forms. It is relevant to our story to cite further that Sanskrit was discovered and the basis of linguistics laid; that a scientific Biblical criticism began, which was destined to share in destroying the authority of Genesis in matters now acknowledged to belong to the domain of science.

The two men who respectively personify the two traditions from which systematic raciology has started are, Blumenbach and Kant. The former approaches the problem of race from the point of view of biological empiricism; the latter, as I have remarked, is the greatest race-theorist of his time. Blumenbach's approach to raciology was to become the pattern for many decades that followed; Kant's attempts were to be almost forgotten.

Immanuel Kant

It is curious to discover that certain leading anthropologists in this country have not been aware that Immanuel Kant was a "founding father" of raciology, although his influence is hard to appraise. He lectured regularly on geography and raciology at the University of Koenigsberg. His works on race are few and not bulky. They begin in 1775 and are scattered over the rest of his life.[5]

[5] See especially his *"On the various races of man"* (1775) and *"Definition of the concept of a human race"* (1785).

To Kant, race is a hereditary matter, while heredity is inherent in the organism itself and not dependent upon environment. However, a proper environmental stimulation may bring out certain inherent, though not previously expressed, characteristics. The original "undifferentiated" human stock, according to Kant, is the brunette-white. The individuals of the stock contain latent "germs" (*Keime*) and when some of the stock moves into a particular climate, the "germs" that best fit it for that environment are called into expression, resulting in morphological and physiological modifications. But this process is irreversible; for the evocation of one germ brings about the permanent suppression of a homologue that would have responded to a different environment. Therefore, even if a tribe belonging to a certain race migrates, as some have done, it cannot reshape its typology. Moreover, some people show that they have gone farther toward complete race expression, while others are less "differentiated."

Four typical races are so derived:

1. The very blond race of the North European damp-cold climate.
2. The copper-red race of the American dry-cold climate.
3. The black race of the Senegambian damp-heat.
4. The olive-yellow race of India's dry-heat.

These elemental races have produced all other races by the process of hybridization. This somewhat simplifies Kant's race theory, but it does it no essential injustice.

This is the first serious race theory on record. The diagrammatic arrangement of climates is perhaps its most obvious defect. How or why Kant arrived at such a system would lead us too far afield. Suffice it to say that it attempts to account for the mutual relationships between heredity and environment consistently with the rest of his hypothecation.

Frequently, the failures of the eighteenth-century mind to go just one step further strike the twentieth-century mind as odd, even baffling. It is, of course, a matter of the superiority of retrospect. Kant's diagram of climates did not prevent him from recognizing that climates can change. He adduces into the midst of his race studies very sharp physiographic reasons for believing that once Central Asia was a great inland sea.

We cannot help recognizing that here are seminal ideas: the evolution of races conceived as radial adaptations; their irreversible and

hereditary nature; their inherent independence of environment; the non-hereditary and purely adaptive nature of such characters as the deepened tan caused in white men by a tropical sun, in spite of the failure of negroes to blanch in Europe.

Kant is already identified, then, as one of the school which claims the original unity of the human genus. The significance of this grows when we examine the conflict between those who adhere to this view and those who believe in a multiple origin for man.

An interesting and curious feature is that Kant accepted genus and race, but not species. We cannot go into the reasons for this, but it does point out the fact that the species-concept was ill-defined in Kant's day. Neither Linneus nor Buffon had settled the matter. We should note, also, that Kant universalizes his biological laws to cover other animals. Certainly, this will be recognized as being consistently Kantian.

Johann Friedrich Blumenbach

Blumenbach's claims to the niche in which a grateful posterity of anthropologists has placed him rests upon the comprehensive scale on which he conceived physical anthropology. Man's anatomy and physiology; his resemblances to other animals and his distinctive characteristics; his special psychology; the diversities in all these matters, among men the world over; his races and their location; all these matters, he treated with the care and caution of a thoroughbred scientist. His materials were an imposing array of dissections, fetuses, crania, and hair specimens. In fact, his private "museum" was one of the showplaces of Göttingen. His treatise, *"On the Variety of Mankind"* (1st ed., 1776), was to set the pattern for decades after his time, and it is still a joy to read. He is remembered today, particularly, for his interest in the shape of the skull as a race diagnostic, and his system of five human races, located in terms of five world-regions. Many a layman, today, unconsciously memorializes Blumenbach by his impression that all mankind is divided into five parts: Caucasian, Mongolian, Negro, Malayan, American Indian.

Blumenbach assumes that species are constant. Also, we must enter to his account the line that is drawn between race and species in such a way that the origin of the former can be accounted for, zoologically, while the origin of species has to be hypothecated only. This is

a weakness that will pervade both camps in the coming argument between the monogenists and the polygenists. Says Blumenbach, "We say that animals belong to one and the same species, if they agree so well in form and constitution, that those things in which they differ may have arisen from degeneration. We say that those, on the other hand, are of different species, whose essential differences are such as cannot be explained by the known sources of degeneration:"* However, as for what constitutes a specific trait, he is avowedly uncertain.

Since Blumenbach ascribes to degeneration the differences in races, we can profitably summarize its manner of occurring: "There is no motion in the animal machine without a preliminary stimulus and a consequent reaction. . . . The genital liquid is only the shapeless material of organic bodies, composed of the innate matter of the inorganic kingdom, but differing in the force it shows . . . by which its first business is under certain circumstances of maturation, mixture, place, etc. to put on the form destined and determined by them. . . . Let me be allowed to distinguish this energy, so as to prevent its being confused with the other kinds of vital force, . . . by the name of formative (*nisus formativus*); by which name I wish to designate not so much the cause as some kind of perpetual and invariably consistent effect . . . just in the same way as we use the name of attraction or gravity to denote certain forces, the *causes* of which however still remain hid. . . . As then other vital forces, when they are excited by their appointed and proper stimuli, become active and ready for action, so also the formative force is excited by the stimuli which belong to it, that is, by the kindling of heat in the egg during the process of incubation. But as the other vital forces, as contractility, irritability, etc., put themselves out only by the mode of motion, this, on the other hand, of which we are talking, manifests itself by increase, and by giving a determinate form to matter. . . . Now the way in which the formative force may sometimes turn aside from its determined direction and plan is principally in three forms. First, by the production of monsters; then by hybrid generation through the mixture of the genital liquid of different species; finally, by degeneration into varieties." Blumenbach then assigns to the various agencies in the environment the warping of the *nisus formativus*. Of course, he has noticed that negroes remain black, even if they have lived in Europe, so that he has to qualify his theory with supplementary assumptions.

* *De Generis Humani Varietate*, ed. 1795, par. 23. Bendyshe's translation.

He is so impressed with the preeminent beauty of the "Caucasian" race, particularly with a female skull from the actual Caucasus region, that he has inflicted upon us poor whites a name that we cannot, apparently, shake off. So the region just north of the Caucasus must be the most probable home for the origin of the human genus, and all other races have degenerated more or less from a pristine ideal.

I offer these sketches of Kant and Blumenbach as samples of eighteenth century anthropological thought, trusting that we all realize that it does not do justice to the richness as well as the limitations of the period. For, the period that is to follow depends, of course, largely on the richness and the limitations which are its legacy.

III

The fall of Napoleon was, in a way, a blow to science. For, hitherto, France had been the leader, and now she had many wounds to lick, some of them of many years' standing. There was no other country ready to step into her shoes. Germany was preparing to do so, but she still had a long way to go. The energies of England had long faced the seven seas quite as much as the continent to her east. Her interests were divided, and there is a limit to what a nation can do at any time.

There was another reason why at least some of the sciences languished. After the treaty of Vienna, political Europe went violently reactionary. The *status quo ante* was to be restored as far as possible. It was an age of disappointment and frustration to those who had expected a new world. Today, we know that the reactionaries were forbidding the tide. New forces were gathering and thrusting upward. Industrialism was gaining momentum. Inventions were mounting. Population was multiplying. Cities were swelling and spilling over. Socialism was born. Like the sun that shineth upon the just and the unjust alike, the British constitution was sheltering Karl Marx, Jeremy Bentham, John Stuart Mill, Thomas Carlyle. The frustrations and the *Sturm und Drang*, and also the *Aufschwung* ("upswing," "soaring") of the young men produced the romantic movements, with their nostalgia for an idealization: Scott, Byron, De Musset, Heine, the Schlegels, Pushkin, Lermontoff, Chopin, Schubert, Schumann, the Hegelians. They also produced the revolts of 1830 and 1848. Through it all, nationalism grew into something unprecedented in the world's history. European man became gradually aware of *movement*—movement

throughout the entire universe. The idea of organic evolution could not have come at an earlier period than it did.

The period saw the estrangement between philosophy and science —a development that has been expensive to both. But that tale belongs to the general history of nineteenth-century thought. It cannot be rehearsed here. It is sufficient to mention that the romantic philosophers, led by Hegel, did not speak the language of the now thoroughly empirical scientists. In a way, we might say that the school of "natural-philosophers" bridged the gap, for among these are some truly great names, such as Alexander von Humboldt, Lorenz Oken, Carl Agardh, Erasmus Darwin, Schelling, and Agassiz. Undoubtedly, we should understand the impulses in raciology better if we were to linger over them. It must suffice for our purposes that an Immanuel Kant becomes an impossibility; and that, when philosophy and science become estranged, the times are truly out of joint.

If we look for the *Zeitgeist* in science, I believe we can cover it with the terms, *movement* and *atomism*. They are obverse and reverse. They seem to be responsible for the mechanistic attitude in science, the so-called scientific materialism. At once, we must distinguish it from philosophic materialism. In science, it is merely the insistence that any scientific account must deal only with processes that are amenable to physical verification. This is why a scientist must be suspicious of any so-called fact that cannot even be conceived as being at least theoretically measurable. This attitude does not take full possession of science until the nineteenth century.

This materialism could not start with the study of man. It had to begin at the other end of the scientific spectrum and work over to man. It illustrates what I have called a cultural lag in science. The early nineteenth century discovers the true nature of heat, formulates the laws of thermodynamics, conceptualizes the conservation of energy. It is but a step to measurements of work and heat output in animals, including man. This is, to be sure, only a short step from the eighteenth century. It would not, of itself, eliminate the vitalism of the physiologist, Bichat (1802). Organic chemicals are still *organic*, until, in 1828, Wöhler synthesizes urea artificially, and the wall between organic and inorganic chemistry begins to break down. There follows the elaboration of the carbon cycle in nature, the discovery of the function of oxygen in the blood and the tissues.

This affects our particular province in two ways. Men become habituated to explaining phenomena exclusively in natural terms. Even phenomena that might be supposed extra-natural turn out to be amenable to natural treatment; as, for instance, when Gall comprehends the significance of the gray matter in the brain. (As Gall also believed in the importance of heredity, he was accused by the Church of being a "materialist" and a danger to the doctrine of free will.) Race psychology travels along with race morphology, through Blumenbach, Prichard, Broca, down to our own post-Darwinian days. Even Linneus opened a sluice when he classified races as having consistently their several particular temperaments.

However, let us not make the mistake of imagining that the eighteenth century could not think at all of a living thing—including man—in mechanical terms. It amused itself by constructing marvelous clockwork dolls. It was aware that the human body is full of levers and pulleys. Nevertheless, this same century produced deism and vitalism, and it was quite consistent in doing so. Interestingly enough, comparisons between man and ape did not shock the eighteenth century as they did the nineteenth. It is the measure between the presence of materialism in the later science and its absence in the earlier. Nineteenth-century (post-Darwinian) ape-man comparisons stood for a blood-relationship between the "soul-less" ape and man. Eighteenth-century comparisons demonstrated certain consistencies of idea in a Deistic universe. The eighteenth century set things in orderly array, thus demonstrating the rationalism of God. As mentioned before, we should understand Linneus, the naturalist, and Leibniz, the philosopher, in this way. It was possible even to construct pseudo-evolutionary theories. For instance, the bird is the *perfection* out of an ancestral flying-fish. Man, himself, can be conceived as having attained perfection out of less perfect ancestors. Kant suggests that the arrangement of man's internal organs indicates that his ancestors once went about on all fours; but, to the eighteenth century, none of this means an organic, evolutionary blood-relationship between man and ape. The ancestral tiger was less perfect than the contemporary tiger; but the whole series of generations started from a separate creation. This is De Maillet's view; it will serve as a sample.*

* Cf. Radl: *Geschichte der Biologischen Theorien*, Vol. II (1909).

This sort of thing was bound, eventually, to undermine the belief in an originally perfect creation; but, in a century of Deism, it had no trouble getting along.

The significance of *movement* to the developing racial thought will come out of itself. But *atomism* requires special attention.

The nineteenth century developed the belief that, if it could take all things apart and reach the ultimate unit, it would have explained the physical universe. It succeeded in discovering the atom and the electron. By 1830, Schleiden and Schwann had put their fingers on the real nature of the living cell (biological atomism). Animals, including man, are dissected, not merely anatomically, but in a temporal sense. That is, they are analyzed back into the embryo, and the embryo leads back to the cell; in fact, to a zygote. We should note, in passing, that movement in developmental anatomy (in ontogeny) is to become a powerful ally of movement in evolutionary anatomy (phylogeny); and so, eventually, to revolutionize the concept of race.

The eighteenth century had gone far in placing man within the framework of natural law, along with all other living things, and the momentum carries over into the nineteenth century. From this standpoint, let us understand the contribution of the Belgian astronomer Quêtelet (1796–1874) to physical anthropology and raciology. In 1835, he publishes a study, "*On Man and the Development of His Faculties.*" It turns out that the same kind of frequency-curves that apply to variations in other natural phenomena are valid for man, too. Now, the measurement of man is known even earlier than the eighteenth century; but Quêtelet's work appears in the midst of the materialist trend in science. Furthermore, he measures the anatomical and physiological differences between races, *e.g.*, between Whites and Indians; and still further, he measures living people. He amasses a series of measurements and calculates their average. Out of averages, he conceptualizes the ideal man ('ideal' in a philosophical sense), the type that characterizes the tendency of the *group*, though no single individual may fit it. Both the manipulation of series and the treatment of measurements mean that man is being introduced to quantitative analysis. The individual turns out to be a law-abiding variant of a law-abiding group, just like many other natural phenomena. In 1842, Anders Retzius, the Swedish anatomist, carries Blumenbach's love of craniology to the

calipers. He measures the length and breadth of crania and takes their ratio. Now, long-heads and short-heads had been noticed long before, and even their occurrence in some systematic way as far back as Vesalius. Certainly, their ethnic significance was stated by Edwards, in 1829, as we shall note again later. But Retzius *measures*, and out of his *cranial index* he determines that all mankind falls into categories of dolichocephals or brachycephals (his own terms), and their incidence is significant geographically. By adding prognathism and orthognathism he achieves a four-way classification.

It is too bad that time will not allow us to follow out all the consequences of this radical step in metric analysis of human races. We must be content with a brief series of comments. First, head-shape could not be referred to any system of environment. It fitted no conceivable set of external circumstances, and apparently it was constant from parent to offspring. This added to the evidential strength of heredity in race. Second, the four-class scheme naturally predetermined the number of human types found. This does not lead necessarily to certain misapplications to race classification; but, as a matter of fact, it has done so, during the twentieth century, when the world distribution of such gross skull-proportions have been misidentified with actual race. Third, a dividing-line between dolichocephaly and brachycephaly is bound to be arbitrary. In fact, this has eventually been realized, and the mesocephals have been created as a buffer. This is one of several refinements that have been introduced into the system. Fourth, it reduces a solid to a plane. I cannot help wondering whether this weakness may not have delayed recognizing the difference, for instance, between Dinarics and Alpines. Fifth, Retzius then classifies mankind in terms of tribes and linguistic stocks, according to their placement in his four classes. About this confusing introduction of tribes and linguistic stocks into a physical classification, there will be more to say later. For the moment, it illustrates a very common pitfall of the period. Nevertheless, it is the fundamental principle of Retzius' method that, in later years, has been applied fruitfully to unraveling the tangle.

After Retzius, especially after Darwin laid stress on many small and "random" variations, craniometrists multiplied measurements and indices, until, at the close of the century, von Török was taking hundreds of thousands on a single skull, in an effort to reach the ultimate in

differences, and craniometry threatened to collapse of overweight. This was nothing else than the *reductio ad absurdum* of the atomistic logic as applied to human quantitative analysis. In all fairness to von Török, he himself recognized this before the whole movement was in ruins.

All these processes are shaping man to fit into a universe of natural, immutable, but mobile law. The climax is to come when evolution is introduced into the whole scheme. But much still remains to be accomplished and we must turn to some contributions from other sciences.

We have observed how Blumenbach illustrates the temper of the eighteenth century in anchoring the several races to geographic locales. In the nineteenth century, as historic depth becomes gradually applied even to an emergent prehistory, the movements of races take on an importance but poorly understood, in the eighteenth. Nevertheless, geography *is* a factor in the race scheme. It needs merely to be evaluated properly. Kant had noticed that the current of human migration set in the direction from Asia to America, that America was an ethnic recipient and not a donor. But the protean situation in the matter of human origins and race diversification that obtains in the period we are considering is reflected in Louis Agassiz. In 1845, he is a monogenist—a believer in a single origin for man. In 1850, he finds eleven or twelve distinct human species. In 1853, he has reduced them to eight, and fits them to eight faunal-floral provinces. Finally, he believes in a multiple origin for man. It is, of course, the inalienable right of any thinking man to change his mind. However, states of mind are not our principal concern. Agassiz was to become a confirmed opponent of Darwin; yet his contribution to raciology comes from studies in the very field that made an evolutionist of Alfred Wallace. Faunal provinces are a *bona fide* part of the equipment of modern zoology. What Agassiz did not realize was that, anti-evolutionist that he was, he yet identified man with the provinces, as though he were but another animal. He was impressed, apparently, with the characteristic adaptations of several masses of humans to several different environments. He was writing in a day before Edward Tyler, when Lyell was establishing historical geology along modern lines, but had not come to be accepted universally; when the *evolution of faunal-floral provinces* was no more than a germ in the minds of such as Wallace; when great, secular movements of man, reaching back even into

sub-human ages, and occurring while climate, too, evolved, were still a concept unseizable by the scientific imagination. However, we cannot, at this time, go into the great subject of anthropogeography and its significance to raciology. The subject was very much alive in the late nineteenth and in the twentieth century.

We have now surveyed contributions from a number of sciences to a gestating anthropology. It is high time that we take up again that strand which after all must ever remain central to scientific raciology: the comparative anatomy and physiology of man—the tradition of Blumenbach, of Cuvier, Geoffroy St. Hilaire, Darwin, Lawrence. The early nineteenth century teems with names that deserve more than mere mention. The leadership of France still shines forth in the preponderance of Frenchmen. But we can catch the flavor of the age by limiting ourselves to Georges Cuvier.

Georges Cuvier

Tradition credits Cuvier with the tripartite division of mankind into blacks, whites, and yellows. Actually, tripartite division was also known to the eighteenth century. Furthermore, Cuvier lists a residue of Malays, Papuans, and American Indians that do not fit his tripartite scheme and, therefore, are of uncertain position. It is very much like accepting three of Blumenbach's categories and doubting the other two. But even if Cuvier did not originate the classification, it is very certain that the enormously painstaking founder of comparative anatomy and paleontology had far more factual evidence to back his taxonomy than his predecessors had. Cuvier's prestige dominated the first third of the century. The tripartite scheme passes down through Huxley (but suitably modified) and is, I believe, the most widely-accepted race scheme among contemporary anthropologists. What seems to me most impressive, however, in this first half of the nineteenth century, is the failure of zoological principles to progress in raciology. More empirical, biological facts about man are gathered in, but new insight into race does not seem to come from them. That is, Blumenbach sounds hardly less modern, a generation after his death, than he did when he was alive. When we come to treat of the use of linguistics in the contemporaneous classifications of man, we shall realize that the conservative caution of empirical biology prevented it from meeting a need which was felt by raciologists.

Let us return to Cuvier, who was far more significant than as the propounder of a usable tripartite taxonomic scheme.

He is remembered, of course, for his famous debate with Geoffroy, in 1830, in which he ostensibly defeated the latter, who stood for some kind of evolution in nature. Cuvier, therefore, is remembered as an opponent of evolution. To Cuvier, the fossils seemed to say that there had been several epochs of past life on earth, each destroyed by some great natural catastrophe; whereupon, the earth was repopulated from living things that had escaped destruction in some asylum. Cuvier's followers turned these repopulations into successive, independent creations, and the perversion has been unjustly ascribed to Cuvier, who has explicitly denied this to be his view. As to where each new seeding came from, he was agnostic. He did believe that each successive inter-catastrophal epoch shows a higher system of fauna. Man did not appear until the present epoch; where from, Cuvier did not say. He declared categorically, "There are no human fossils." For his day, he was right. Cuvier himself had examined alleged human fossils and had found them erroneous—some of them ridiculously so.*

Cuvier, however, rendered a service that cannot be overestimated. While his catastrophism was a mistaken interpretation, soon to be refuted by the classic geological explorations of Sir Charles Lyell, it was Cuvier who gathered and arranged the empirical evidence that there had been a progressive succession of faunas on earth. As a result, the static picture, which was all that the eighteenth century could offer, begins its slow movement. With Cuvier, biological nature begins to turn kinetic. The evolution of human races is involved along with all other evolution.

Edward Lawrence

This greatest physical anthropologist, between the time of Kant and Darwin, cut an unhappy figure. At 34 (in 1817), the famous surgeon and professor made utterances not heard again for over two generations. He raised a tremendous hue and cry. His published lectures

* The Cannstadt calvarium was found in 1700. It was not pictured or described until 1835, and then, but poorly. We do well to remember that a Gibraltar specimen, discovered in 1848, and the first Neanderthal specimen, found in 1856, were all the paleontological evidence of ancient man in existence before the publication of Darwin's "Origin of Species." One has no right to expect a scientist to pin his convictions to as slender a piece of incipient and unprecedented evidence as the Gibraltar specimen. Schaaffhausen described the Neanderthal skull. As he had already announced his belief in evolution before Darwin published, he boldly welcomed this corroboration. Virchow, the pathologist, declared the specimen to be merely pathological *Homo sapiens*. In the state of knowledge in that day, the interpretation was quite reasonable.

were refused copyright. He was forced by his superiors to repudiate them; and, although he is known to have had the natural courage of his convictions, for some reason never again did he busy himself with anthropology. What his maturer mind might have produced is an attractive speculation. He lived to advise Darwin against publishing his ideas, lest he be pilloried; but the ideas of the young man in his thirties continued their momentum underground, as repeated and widespread references to them during this period testify. Because he could not procure a copyright, he was forced to see publishers pirate edition after edition of his lectures, to which he never contributed further.

Lawrence dedicated his lectures to Blumenbach. From the latter, obviously, he derived his comprehensive scope for surveying mankind. Although he found Blumenbach's race classification wanting in several respects, he did not undertake to improve upon it, but showed himself to be a keener biologist than Blumenbach. His lectures are still an inspiration to read. He says:*

"1. The differences of physical organization and of moral and intellectual qualities, which characterize the several races of our species, are analogous in kind and degree to those which distinguish the breeds of the domestic animals; and must, therefore, be accounted for on the same principles.

"2dly, they are first produced, in both instances, as native or congenital varieties; and then transmitted to the offspring in hereditary succession.

"3rdly, of the circumstances which favor this disposition to the production of varieties in the animal kingdom, the most powerful is the state of domestication.

"4thly, external or adventitious causes, such as climate, situation, food, way of life, have considerable effect in altering the constitution of man and animals; but this effect, as well as that of art or accident, is confined to the individual, not being transmitted by generation, and therefore not affecting the race."

The following statement concerning what is hereditary and what is not is even startlingly modern:

"When the fetus in utero has small-pox or syphilis, there is actual communication of disease by the fluids of the mother. This is a case

* *Lectures on Comparative Anatomy, Physiology, Zoology, and the Natural History of Man:* 470 ff. 1823.

altogether different from those under consideration. Neither does hereditary predisposition to particular diseases prove that acquired conditions are transmitted to the offspring. There are natural varieties of organization, disposing different individuals to different diseases on application of the same external causes. The natural varieties, like those of form, colour, and other obvious properties, are continued to the children."

That the influence of Lawrence, like that of Kant, should have been largely lost from raciology, is a great pity. That Lawrence can hardly have been "*spurlos versenkt*," however, is suggested by the pirating of his book. Topinard related that Broca made him read Lawrence's lectures, and Cunningham, in 1908, who repeated this remark, said that it was his practice, too, in connection with his own students in anthropology.

We have been feeling the temper of scientific thought in this earlier half of the nineteenth century, and will soon be turning to the other great influence upon raciology. We cannot do better, in winding up this part of our discussion, than treat of the prime controversy over race and species that stormed down the decades and continues even in our own day. It makes a better transition, because it was effected by a vexed social and economic problem of the day, and it demonstrates that even scientists are human.

I refer to the battle between the monogenists and polygenists, in which the contestants still carry the aroma of Biblical tradition in their vestments, and where the negro slave suffers the usual fate of the innocent bystander.

Again, we must go back into the preceding century, and recall a remark by our contemporary, Toynbee, that our earlier efforts towards arriving at an explanation of man's races utilized the theological materials already at hand. Can Adam and Eve assume the responsibility for kinds of men obviously unmentioned in the Bible? In 1655, la Peyrère did a courageous thing. He published his *Pre-Adamites*—and became the progenitor of the polygenists, who have always believed that humankind has a multiple origin.

Now, if you are a polygenist, you must explain the interfertility of the numerous human "species" (races). If, on the other hand, you believe that all mankind descended from one species, in spite of every objection, you must account for the diversity of races and evaluate

heredity and environment in producing so much diversity from a slender original stock. It really is a difference in your psychology. As a polygenist, you are impressed with the diversities. As a monogenist, you prefer similarities. Which are the more fundamental? On what premises do you answer that question? Your school, moreover, will affect your receptivity towards the very meager evidence as to human hybrid fertility and quality.

Today, we can see that the tide was setting against the polygenists, long before it was realized by the warring parties themselves. While the polygenists included some doughty champions, such as Agassiz, Pouchet, Nott, and Glidden, the most memorable names in the history of raciology are monogenists; *e.g.*, Blumenbach, Cuvier, Lawrence, Prichard. Blumenbach derived the colored races from the white by degeneration. Cuvier seems to have been aided to his tripartite scheme by Noah's three sons (as others have been). Prichard thought original man was black and that the rest of us have undergone various intensities of bleaching. In any case, it is no great mental gymnastics to imagine that men have endlessly "degenerated" or diversified, however they have done it. You find mankind as full of races as you wish; which, in fact, was what race-taxonomists were doing, under a variety of assumptions. But, if you multiply original "species" under the polygenist assumption, you call into being a new set of stem-parents with every new identification, unless you account for some of them by hybridization; in which case again, you are confronted with an endless interspecific fertility, and to the polygenists this idea often was not congenial.

An attempt to outline in a very few sentences as diversified a controversy as this one, and also one in which the hypotheses have received the stamp of time and have been relegated to the archives, is always likely to be unjust to the caliber of the disputants. Perhaps the thought-fashion of the days just before Darwin can best be hinted at by a short quotation from the judicious Waitz, who writes on the eve of the *Origin of Species:**

"In condensing the results of our investigation regarding the definition of species, we have found that it designates those types permanent which are transmitted by propagation. We were induced to separate the questions of unity of species and unity of descent on the ground

* Waitz: *Anthropology*, I. Collingwood's translation: 32 ff. 1863.

that the same assemblage of constant characters may belong originally to distinct stocks; and we could not, therefore, consider unity of descent as necessary to our definition of species. If, thus, separate descent was no valid proof for difference of species, unlimited prolificacy proved an important, but not a decisive mark of distinction between species and race, and could only be considered as a probable sequence.

"Finally, reversion and its allied phenomena appeared insufficient to furnish an undoubted criterion of species and race. And as it became apparent that such a criterion could not be established, we hoped that the defect would be supplied by the conclusions of analogy furnished by the comparison of various species. This expectation was also doomed to disappointment, as the limits of variation in different types seem to be of a greatly diversified extent. . . . The general question as regards a decided mark of distinction between race and species can only be answered by the particular study of the extant variation in individual types. . . .

"The investigation of the unity of mankind as a species can only be finally completed, when the results of long continued influences of all possible external conditions in which man is able to live, are as fully and clearly ascertained, as the results of all possible crossings of various human types after a long series of generations. But as our experience in this respect is very far from being perfect, we are compelled to stop at some more or less probable propositions, which must proceed from the solution of the question, whether a gradual alteration of types belonging to the same stock can be proved, and whether it be sufficiently extensive in order to show that the greatest differences prevailing among mankind are merely variations. Next to that the question will be, whether the cross-breeds of the various types, by limited prolificacy, or by constant reversion to the parent type, resemble more the hybrids or mongrels of different races."

It seems that the futile impasse to which argument between the camps had come was due to their failure to absorb the mechanistic temper of the age enough to think of species and race in the same way. They seemed to place the two concepts in different compartments of thinking, at least at the start of the controversy. About species, they did not postulate the mode of origin. They accepted species as a starting-point, whatever a species may be, and then sought to derive races by quite natural means. At least, that was the essential method of

the monogenists. But unless we appreciate the practice of assuming the fact of species and then focusing upon race origins, we cannot sense the explosive impact of such an eventful title as the *Origin of Species*. Even the great geologist, Sir Charles Lyell, who founded historical geology and overthrew Cuvier's system of successive catastrophes, was long reluctant to accept Darwin's hypothesis, much to Darwin's chagrin and disappointment.

It is interesting that both monogenists and polygenists were convinced of the superiority of the white race; although, to be fair, there were some who suspended judgment about racial "inequality." The humane Lawrence stated that if the negro is inferior, nevertheless, he is human. This is an echo of Soemmerring (1785). "But if the white is superior," says Lawrence, "then *noblesse oblige*." Lawrence spoke in the days when England was getting rid of the slave trade. There were pro-slavery people who accepted monogenism and cited Noah's curse of Ham to justify themselves. On the other hand, polygenism seems to have been a more congenial attitude, if you were a pro-slaver. It was favored by many (see Nott and Glidden). That the whole question of the position and status of the negro agitated the students of man, is witnessed by a very long deliberation by the French society of ethnology. The role of science is to ascertain the truth, and not to engage in social propaganda. The deliberation was to ascertain the truth. It demonstrated perfectly how society posed a problem which the students of man were obliged to consider. At the same time, as far as I know, none of the conclusions of the scientists had any effect whatsoever in settling the issue of negro slavery.

Since our story is to go no farther than the eve of Darwinism, let me clinch the difference of outlook in biology before and after this event, for raciology eventually partakes of it.

"We have had occasion," says Radl,* to point out that the new natural science, instead of seeking to *comprehend* nature, aspired to an *intellectual reproduction of natural events;* that instead of *concepts* of nature it sought a *photograph* of nature. Everywhere we see how, in keeping with this endeavor, the earlier *concepts-in-common* were banished from the biological sciences and were replaced with *things-in-common*. Whereas the old natural-scientist spoke of the ideal vertebrate type, the new one speaks of a real ancestor of the vertebrate,

* *Op. cit.* II: 378 ff.

which occurred somewhere and sometime; formerly, one reflected about metamorphoses and unity of plan, now one discusses transformations which occurred at a certain time and proceeded from a common origin; the former *ideal* similarity is now replaced by a *material blood-relationship.*"

IV.

We have been tracing, thus far, the biological tradition from which the idea of race in man has derived. We have remarked that anthropology does not become a self-contained and unified discipline until the mid-century. We have seen this evidenced by the fact that the most important ideas that have gone into it were wrought out in other disciplines and then applied to man; while that region which is peculiar to raciology, namely, the classification of races, is the least progressive part of the whole concept, because its biology, after all, is not deep enough. We have noted the divorce between philosophy and science. In this period, there comes to raciology a new mass of influence; and it is not from the laboratory or the explorer's journal, but from the clash and clang of the life of nations. I have no better name for it than the cultural or the social as contrasted with the biological influence. It has to do with that other great adjustment which European man has been making: the adjustment within his own bounds, the understanding of himself down to the very biological roots which his fast-developing nationalism has demanded of him. It has to do with that use of the word "race" on a smaller scale, to distinguish the various strains of which he is composed. He will try to unravel these strains and trace whence they come. History has already told him that some of them, at least, are invaders within cultural memory. But what of the others? Perhaps language can help identify them. In the absence of written documents, the evidence of the new science of prehistoric archeology must serve. In last analysis, to serve for identification, there can be no substitute for the actual corporal man. The real significance of heredity compared with environment must be settled, and so the road leads back to biology.

In the eighteenth century, Europe discovered Sanskrit; and, thereafter, that most of the languages lying in a swathe from Iceland to India belong to a common family and indicate a common original. It was one more earnest of universal evolution that European thought was building up before Darwin. It came at a time when European

nationalism was beginning to soar; at a time when the *people* of a nation were taking the stage of attention more pervadingly and in a more sophisticated manner than ever before. It is as though the nations were following Napoleon's military *levée en masse* with a cultural *levée en masse*. . . .

In 1828, in the recently-defeated France, Amédée Thierry published his *History of the Gauls*. The last word is significant. It bespeaks a progression since the day when Gibbon wrote *The Decline and Fall of the Roman Empire*. In 1829, W. F. Edwards published in antiphony to Thierry *The Physiological Characteristics of the Human Races*. Institutions and their history may pass away, but peoples endure. Edwards concentrated on the people of France, but passed far beyond her borders. There are two distinguishable types in France, that occur also in neighboring countries. One is medium in stature, rather dark, and round-headed including the "Gauls," whose speech was once Celtic. The other is a tall and long-headed race, the "Kimri," alias the "Belgae." Both natural history and "civil" history, according to Edwards, testify that they have maintained constancy since antiquity; which means that, in this case, heredity is stable. Edwards cited the experiments of Coladon on the crossings of black and grey mice. The two strains appear separately in the offspring. He applied this to man. "The human races that differ the most from each other," he says, "constantly produce hybrids. Thus a mulatto is always the result of a mixture of white and black races. The other observation, that the two original types are produced when the parents belong to two close varieties, is less notable, but it is none the less true. The fact is common among the European nations. Crossing produces sometimes fusion, sometimes separation of types."

The French had long been used to the knowledge that they were of mixed origin. Edwards initiated the investigation that was later carried to a brilliant point by Broca (1860), which demonstrated the racial make-up of the nation and related it to the historical and linguistic background. The significant point, here, is that Edwards started a line of investigation that determined the relationships—and non-relationships—between race, language, and nation, on a historical and anthropological basis. The fact of race diversity in Europe transects national boundaries at the very time when nationalism is becoming more intensively significant, and the fact owes its elaboration, in part, to the national self-consciousness with which it does not coincide.

The linguists, meanwhile, were busy with the question, "What was the original Indo-European tongue?" To which, the students of race respond, "Yes, but who were the Indo-Europeans?" It was natural to reason that so distinctive an entity as an Indo-European language must once have been carried by a distinctive strain of people. By now, no raciologist would argue that climate makes the difference between a Swede and a Hindu. However, language eventually proved to be a less reliable and fruitful guide to race identification than it had seemed to promise. Nevertheless, who were the people who originated Indo-European speech in Europe?

James C. Prichard

In this period, the greatest figure is the English Quaker physician, Prichard, whose monument is his *Natural History of Man* (1843) and his *Researches into the Physical History of Man* (1826–1847, and later). The first volume of the latter work starts with fauna and flora, describes man the animal, and then takes up the problem of race in man. However, this encyclopedic and very painstaking research then follows *tribes* back into their history, and describes what, today, would be ethnology. Nevertheless, it does not define "race." Prichard's linguistic division of Europe and Asia is into Indo-Europeans and "Allophylans."

Now, Europe rushed to a climax.

In 1853, Gobineau published his *Essay on the Inequality of Races;* embarked on a series of wars: against Austria (with Sardinia), against Russia (with England), against Mexico, and finally against Prussia and her German coalition (1870–1).

In 1853, Gobineau published his *Essay on the Inequality of Races;* dedicated it to the English crown; was ignored by his own compatriots and, eventually, was taken up by their rivals across the Rhine;

1856, Quatrefages became the first Professor of Anthropology;

1858, The English crown took over the government of India;

1858, Broca founded the first Anthropological Society;

1859, Darwin's *Origin of Species* was published;

1860, Sardinia became the Kingdom of Italy;

1860, Broca's Researches into the Ethnology of France appeared;

1861, Nationhood in the United States was brought to its critical test;

1863, The Anthropological Society of London was founded;

1866–1871, Prussia eliminated the challenges of Austria and France for the hegemony in Europe, and founded the German Empire; and in 1871, Italy took Rome;

1865, Anthropological or Ethnological Societies were founded in New York, St. Petersburg, Moscow, and from 1866 to 1874, in Manchester, Florence, Berlin, Vienna, Stockholm, and Tiflis.

I have presented the dichotomy of tradition behind the concept of race in the pre-Darwinian nineteenth century: a biological tradition and a social one. The former, we have watched take shape out of an eighteenth-century matrix, in which the philosophical aspect, embodied in its highest form by Kant, was sloughed off; while the aspect best embodied by Blumenbach was continued. We have noted, also, that general biology underwent a certain critical development, during the period we have examined particularly, but that the application to man remained such as to warrant our speaking of the period as one of gestation only. On the other hand, the social tradition grew mightily, particularly in France; so that raciology drew sustenance from a rapidly-developing ethnology. In fact, I think we should find raciology in danger of becoming but a part of ethnology. By mid-century, ethnology and anthropology were a pair of fidgeting nestlings not quite sure of their respective rights in a common nest. Also, do not imagine that the birth of the anthropological societies was a simple triumph of circumstances. The midwives who attended had their problems. Broca's anthropological society in Paris was tolerated on condition that the police attend each meeting. In England, the Anthropological Society ran into a maze of suspicions and jealousies among the scientists —the very people who should have cheered its founding. (Admittedly, the founders must share the blame therefor.) The point is, that again we have one of those many, many instances when the times are indeed ripe for a new movement, but only a small portion of society is sensitive enough to realize it.

While Napoleon III and Bismarck were duelling before the footlights, an equally significant struggle was going on upstage. I have spoken of Broca's founding the Anthropological Society of Paris and his publishing in its first Mémoire his classic *Researches into the Eth-*

nology of France; furthermore, that he so builds beyond Edwards. France seeks the sources of her greatness in the excellence of her mongrelization on a soil she is peculiarly in love with; while an emergent Germany welcomes Broca's compatriot because he points to a polarly contrasting source: the romance of either a pure-bred strain or an integrated ethnos (or both) that must be preserved intact. The German story is told to better advantage in a treatment that runs away beyond the limits we have set ourselves; and our time is running out.

Let us conclude by speaking of Gobineau.

He is celebrated for his tenet of an Aryan race, superior to all others, which brings the blessings of culture wherever it goes. There is no other race that does this. When it enters among a non-Aryan people, it degenerates by interbreeding and so disappears. Its salvation, then, rests in its native soil—remote from the Mediterranean. Gobineau obviously has drawn nourishment from the developments in ethnology and raciology in his homeland.

I would emphasize that Gobineau is not a unique phenomenon; that he stands forth under the peculiar lighting-effects of latter years, because of circumstances subsequent and entirely independent of his writings. For the belief that a superior race is endangered biologically when it passes from its homeland to any or all quarters of the globe, was very rife in the mid-nineteenth century. Back of it lay the commercial and colonizing expansions of Europe. There were Englishmen who worried about the Anglo-Saxon in the tropics, in Australia, and even in the United States. The peculiar service of Gobineau was the particular furtherance he gave to Aryanism, and this *within* the continent of Europe. Again, a very intricate and significant subject must forego analysis. I shall merely hint at it by remarking that Angles and Saxons were more substantial, historically, than "Aryans," and, while British penetration into exotic lands has repeatedly been dire, it can hardly parallel the situation of a racism that arises within the ever-tightening confines of Central Europe, with its extremely high cultural metabolism and long-standing rivalry between two nexuses that are cultural peers—Germany and France.

So let me speak briefly of Robert Knox, the British equivalent of Gobineau, an intense believer in "race," and a "Saxon" patriot. His *Races of Man: a Fragment* first appeared in 1850—before Gobineau's book. In some ways it outdoes Gobineau. Aside from that, he fears

for the degeneration of the emigrant Saxon. Nevertheless, he can declare the vices and imperfections of the "Saxon race" as virulently and as thumpingly as its virtues. He does not like to see the Saxon exposing himself disastrously in situations that bring out his weaknesses, and Saxon patriotism does not preclude an admiration of the "Celtic race" in its place. The point is, that Knox makes all the currents of history racial, at base, a tradition that has lasted to our own times.*

* Cf., *e.g.*, R. B. Dixon's *The Racial History of Man.*

SECTION OF BIOLOGY

JANUARY 17, 18 AND 19, 1946

Conference on "*Antibiotics.*"

The Section of Biology held a Conference on "Antibiotics," as the third in the series for the Academic year, 1945–1946.

The program consisted of the following papers:

Thursday, January 17. Chairman, Selman A. Waksman, New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, New Jersey.

"Antibiotic Substances, a Contribution of the Microbiologist," by Selman A. Waksman.

"The Development of Improved Penicillin-Producing Molds," by Kenneth B. Raper, Fermentation Division, Northern Regional Laboratories, Peoria, Illinois.

"Metabolism and Penicillin-Producing Molds," by W. H. Peterson, M. J. Johnson, and R. H. Burris, University of Wisconsin, Madison, Wisconsin.

"Production of Antibiotic Substances by Basidiomycetes," by W. J. Robbins, F. Kavanagh, and Mrs. A. Hervey, Department of Botany, Columbia University and The New York Botanical Gardens, New York, N. Y.

"Production of Antibiotic Substances of Actinomycetes," by Selman A. Waksman, A. Schatz, and D. M. Reynolds, New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, New Jersey.

"Production of Antibiotic Substances by Bacteria," by J. W. Foster and H. B. Woodruff, Merck and Company, Rahway, New Jersey.

Friday, January 18. Chairman, Hans T. Clarke, College of Physicians and Surgeons, Columbia University, New York, N. Y.

"Isolation and Characterization of Penicillins," by Oskar Wintersteiner, The Squibb Institute for Medical Research, New Brunswick, New Jersey.

"The Skeletal Structure of Penicillin," by Karl Folkers, Merck and Company, Rahway, New Jersey.

"Constitutional Studies of Penicillin," by Vincent du Vigneaud, Cornell University Medical College, New York, N. Y.

"Artificially Produced Penicillins," by Ervin C. Kleiderer, Eli Lilly and Company, Indianapolis, Indiana.

Saturday, January 19. Chairman, Chester S. Keefer, Evans Memorial Hospital, Boston, Massachusetts.

"Pharmacology of Streptothricin and Streptomycin," by Hans Molitor and H. Robinson, Merck Institute for Therapeutic Research, Rahway, New Jersey.

"Pharmacology of Penicillin," by Geoffrey Rake and Arthur P. Richardson, The Squibb Institute for Medical Research, New Brunswick, New Jersey.

"Chemotherapy of Streptomycin," by H. C. Hinshaw and William H. Feldman, Mayo Clinic, Rochester, Minnesota.

"Chemotherapy of Penicillin," by Chester S. Keefer.

"Some Considerations of the Clinical Application of Streptomycin," by Garfield G. Duncan, Major A. Kleinman, and Captain E. Pulaski, Jefferson Medical College, Pennsylvania Hospital, Philadelphia, Pennsylvania, and Halloran General Hospital, Staten Island, New York, N. Y.

"Use of Antibiotics in the Navy," by Commander Werner Duemling, (MC), USNR, Bureau of Medicine and Surgery, Washington, D. C.

"Methods of Testing Antibiotic Substances and Limitations Involved," by Henry Welch, William A. Randall, and Lila A. Knudsen, Food and Drug Administration, Washington, D. C.

THE NEW YORK ACADEMY OF SCIENCES

announces

THE A. CRESSY MORRISON PRIZE CONTEST FOR 1946

The New York Academy of Sciences announces three prizes offered by Mr. A. Cressy Morrison, to be known as the A. Cressy Morrison Prizes I, II and III, all of which will be awarded in December, 1946. Prize I, of $500, will be awarded for the best paper on solar and stellar energy as defined below. Prizes II and III will be awarded for the best papers on a scientific subject included within the field of The New York Academy of Sciences and its affiliated Societies. The terms governing these competitions are detailed herwith.

Prize I

A prize of $500 is offered for the paper adjudged by the Council of the Academy to be the most meritorious contribution on the subject of the source of solar and stellar energy.

Introductory Statement

Understanding of the source of solar and stellar energy begins with Helmholtz's contraction theory (1854). As the primordial star contracts, the kinetic energy of the mass particles closing in under the force of gravity is transformed into heat energy. Whereas this is still believed to be cosmologically the first cause of stellar radiation, it has been realized since the end of the previous century that the process of contraction would run to its end in a time that is short as compared to the age of the earth; and, ever since this was realized, astronomers have been compelled to postulate that the Helmholtz contraction must be retarded and, for the major part of the life of the star, probably balanced by an internal pressure caused by energy that does not derive from kinetic energy. The way out of this difficulty was cleared theoretically (1905) by Einstein's law of the equivalence of mass and energy, although the exact mechanism whereby, under stellar conditions, matter would change into radiation, remained still a secret. The first laboratory transmutation of nitrogen into an isotope of oxygen by Rutherford (1917) opened the field of nuclear reactions which led to the experimental results; namely, that the mass lost in a nuclear reaction and the energy set free are in accordance with Einstein's law. By examining all possibilities of reactions that could take place under conditions prevailing in the sun, Bethe (1939) succeeded in singling out the one reaction that should, both as to the requirement of temperature and as to the availability of the elements involved, take place at the proper rate. This is the so-called carbon cycle whereby the energy liberated is equivalent to the mass defect of the helium atom as compared to four hydrogen atoms.

Prodigious progress has been made since the first A. Cressy Morrison Prize on the above subject was offered in 1926.* It is, however, felt that the complete answer has not yet been given and many questions remain open. In the first

* The subject for competition originally suggested by Mr. Morrison was as follows:

"The principle source of energy of the sun is intra-atomic energy existing within the normal atom itself which is released from the atom under the conditions of temperature and pressure which exist in the sun."

An A. Cressy Morrison Prize on the above subject was awarded in December, 1926, to Donald H. Menzel of Lick Observatory, University of California. The same author, in collaboration with P. B. Gerasimovic of Harvard College Observatory, also won the prize awarded in December, 1928. In 1930, the prize was awarded to Professor H. von Zeipel, of the University of Upsala, Sweden, for his paper entitled, "*The Evolution and Constitution of Stars*" and the most recent prize was awarded in 1938 to Hans Bethe.

place, no final model for the sun, properly satisfying the observed luminosity and the hydrodynamical considerations, has been published. Secondly, at best a start has been made on the problem of the so-called "red giants," "sub dwarfs," and "white dwarfs." Through the continued interest of Mr. Morrison and his desire to stimulate further research in the subject, the above prize will be renewed for award in 1946.

Prizes II and III

Two prizes of $200 each, offered by Mr. A. Cressy Morrison, to be known as the A. Cressy Morrison Prizes in Natural Science, will be awarded at the Annual Meeting, December, 1946, for the two most acceptable papers in a field of science covered by the Academy or an Affiliated Society.

Conditions

(1) Eligibility. The competition for Prize I is open to all. Authors and co-authors competing for prizes II and III shall be members in good standing of The New York Academy of Sciences and Affiliated Societies, but non-members may become eligible by joining one of these organizations before the closing date.

(2) Date. Papers are to be submitted on or prior to October 1, 1946, to the Executive Secretary of The New York Academy of Sciences, at The American Museum of Natural History, Central Park West at 79th Street, New York, N. Y.

(3) Papers. All papers submitted must embody the results of original research not previously published. The manuscript shall be typewritten, in English, accompanied by all necessary photographs, drawings, diagrams and tables, and shall be ready for publication. Papers must be accompanied by a summary of the data presented and conclusions reached.

(4) Awards. The awards shall be made by the Council of The New York Academy of Sciences. If, in the opinion of the judges, no paper worthy of a prize is offered, the award of a prize or prizes will be omitted for this contest.

(5) Publication. The Academy shall have first option on the publication of all papers submitted, unless especially arranged for beforehand with the authors, but such publication is not binding on the Academy.

(6) Wherever and whenever published, the papers awarded the prizes shall be accompanied by the statement: "Awarded an A. Cressy Morrison Prize in Natural Science in 1946 by The New York Academy of Sciences."

Such statement in substance must also accompany any formal publicity initiated by the author regarding the prize paper. If published elsewhere, six copies of each prize paper must be deposited shortly after publication with the office of The New York Academy of Sciences.

THE NEW YORK ACADEMY OF SCIENCES,

Central Park West at 79th Street, New York, N. Y.

EUNICE THOMAS MINER,
Executive Secretary.

NEW MEMBERS

Elected January 24, 1946

LIFE MEMBER

Tainter, Maurice L., M.D., Pharmacology and Medical Research. Director of Research, Winthrop Chemical Company, Inc., Rensselaer, N. Y.

SUSTAINING MEMBERSHIP

Naugle, John Jay, Physics and Chemistry. President, John Jay Naugle Laboratories, New York, N. Y.
Owen, Joseph Walker, M.D., Medicine (Psychiatry). New York, N. Y.
Ruskin, Simon L., M.D., Biochemistry and Medicine. New York, N. Y.
Silber, Robert H., Ph.D. Department Head, Biochemistry, Merck Institute, Rahway, N. J.

ACTIVE MEMBERSHIP

Ablondi, Frank B., B.A., Biochemistry, Physiology. Research Chemist, Lederle Laboratories, Pearl River, N. Y.
Adams, Sidney F., M.A., Geology and Mineralogy. Assistant Manager, The New Jersey Zinc Company, New York, N. Y.
Ales, Victor, M.A., Psychology, Personality and Vocational Guidance. Instructor, Psychology, School of Commerce, New York University, New York, N. Y.
Alicino, Joseph F., M.A., Microanalytical Chemistry. Squibb Institute, New Brunswick, N. J.
Altschul, Rolf, Ph.D., Organic Chemistry. Member of Faculty, Sarah Lawrence College, Bronxville, N. Y.
Anderson, George W., Ph.D. Research Chemist, American Cyanamid Company, Stamford, Conn.
Aronson, Lester R., Ph.D. Biology—Animal Behavior. Assistant Curator, Department of Animal Behavior, American Museum of Natural History, New York, N. Y.
Baer, Harold, Ph.D., Organic Chemistry. Research Associate, Bacteriology, College of Physicians and Surgeons, Columbia University, New York, N. Y.
Bartle, Glenn G., Ph.D. Geologist, E. Holly Poe and Associates, New York, N. Y.
Berger, Julius, Ph.D., Biochemistry and Microbiology. Senior Chemist, Hoffman-LaRoche, Inc., Nutley, N. J.
Berman, Nathan, Ph.D., Nutrition and Medicine. Member of Technical Staff, U. S. Vitamin Corp., New York, N. Y.
Berman, Sidney, M.D., Muscle Physiology. Resident in Neurology and Neuropathology, Mt. Sinai Hospital, New York, N. Y.
Bernheimer, Alan W., Ph.D., Bacteriology and Immunology. Assistant Professor of Bacteriology, New York University College of Medicine, New York, N. Y.
Black, Maurice M., M.D., Neoplastic metabolism. Physician, Brooklyn, N. Y.
Bourret, G. Weston, B.S. Mining Geologist, Union Mines Development Corp., New York, N. Y.
Breitbart, David Siege, Zoology. Pre-Medical Student, College of the City of New York, New York, N. Y.
Brereton, John G., Ph.D., Food and Pharmaceutical Chemistry. Chemist in charge of Product Development, Sheffield Farms Company, New York, N. Y.
Brown, Jack Harold, B.S., Physiology and Biochemistry. Research Associate, Bureau of Biological Research, Rutgers University, New Brunswick, N. J.

Cantoni, Giulio L., M.D., Biochemistry. Assistant Professor in Pharmacology, Long Island University College of Medicine, Brooklyn, N. Y.

Capps, Elbert R., M.A. Instructor in Physiology, New York Medical College, Flower and Fifth Avenue Hospitals, New York, N. Y.

Carson, Stanley F., Ph.D., Physiology and Biochemistry. Head, Microbiology Department, Wyeth Institute of Applied Biochemistry, Philadelphia, Pa.

Carter, Anne Cohen, M.D., Endocrinology. Assistant in Medicine, New York Hospital, New York, N. Y.

Chase, Jeanne H., Ph.D., Bacteriology, Immunology. Department of Biology, Schering Corporation, Englewood, N. J.

Cieslak, Arthur K., M.D., Surgery and Surgical Pathology. Assistant in Surgery, College of Physicians and Surgeons, Columbia University, New York, N. Y.

Clark, Joe H., Ph.D., Organic Chemistry and Chemotherapy. Research Chemist, American Cyanamid Company, Stamford, Conn.

Clausen, Donald F. Research Biochemist, Sharp and Dohme, Inc., Glenolden, Pa.

Craver, Bradford N., Ph.D., M.D., Pharmacology. Ciba Pharmaceutical Products, Inc., Summit, N. J.

Crittenden, Phoebe Jeannette, Ph.D., Physiology and Pharmacology. Research Associate, Merck Institute, Rahway, N. J.

Cuttita, Joseph A., D.D.S. Assistant Professor of Dentistry, Columbia University, New York, N. Y.

Dahl, Roland J., B.S., Medical Science. Director, Product Development, E. R. Squibb & Sons, New York, N. Y.

Davenport, Horace Willard, Ph.D. Professor and Head, Department of Physiology, University of Utah, School of Medicine, Salt Lake City, Utah.

Dimond, Albert Eugene, Ph.D., Plant Pathology and Physiology of Fungi. Associate in Plant Pathology, Connecticut Agricultural Experiment Station, New Haven, Conn.

Donovick, Richard, Ph.D., Bacteriology. Research Associate, Squibb Institute for Medical Research, New Brunswick, N. J.

Dotti, Louis Basil, Ph.D., Biochemistry. Chemist, St. Luke's Hospital, New York, N. Y.

Drago, Anna M., B.A., Biology. Graduate Student, College of New Rochelle, N. Y.

Duca, Charles J., M.S., Medical Bacteriology. Assistant, Department of Bacteriology, Columbia University, New York, N. Y.

Dunn, Max Shaw, Ph.D. Professor of Biochemistry, University of California, Los Angeles, Calif.

Elias, Helen V., M.A. Research Geologist, Union Mines Development Corp., New York, N. Y.

Feinstone, W. Harry, Sc.D., Chemotherapy, Bacteriology. Director of Biological Research, Pyridium Corporation, Yonkers, N. Y.

Ferguson, Frederick Palmer, Ph.D., Physiology and Biochemistry. Research Associate, Bureau of Biological Research, Rutgers University, New Brunswick, N. J.

Fitch, Howard M., Ph.D., Organic Chemistry. Research Associate, New York University College of Medicine, New York, N. Y.

Forke, Kathleen Patricia, B.S., Biology. Graduate Student, College of New Rochelle, N. Y.

Gaunt, Robert, Ph.D. Associate Professor, Department of Biology, New York University, New York, N. Y.

Gordon, Samuel M., Ph.D., Chemistry. Director of Research (Vice-President), Endo Products, Inc., Richmond Hills, N. Y.

Greenstein, L. M., Ph.D., Physical Chemistry. Chemist, Mearl Corporation, New York, N. Y.

Gutman, Alexander B., Ph.D., M.D. Assistant Professor of Medicine, College of Physicians and Surgeons, Columbia University, New York, N. Y.

Halverstadt, Isaac Frederick, Ph.D., Chemistry and Medicine. Research Chemist, American Cyanamid Company, Stamford, Conn.

Hand, David B., Ph.D., Biochemistry, Food Products, Pharmaceuticals. Technical Director, Sheffield Farms Company, Inc., New York, N. Y.

Harris, Ad, Immunology, Bacteriology, Chemistry related to Serology. Serologist, V. D. Research Laboratory, U. S. Marine Hospital, Staten Island, N. Y.

Harris, Ira Henry, Ph.D., Biochemistry, Bacteriology, Nutrition. Director, Metchnikoff Laboratories, New York, N. Y.

Harrower, Molly, Ph.D., Psychology (Clinical Application). New York, N. Y.

Hays, Edwin E., Ph.D., Biochemistry (Anemia), Assistant Professor of Biochemistry, University of Vermont, College of Medicine, Burlington, Vt.

Hehre, Edward James, M.D., Bacteriology, Immunology, Medicine. Assistant Professor of Bacteriology and Immunology, Cornell University Medical School, New York, N. Y.

Hewitt, Eric John, Ph.D. Consulting Chemist, Ralph L. Evans Associates, New York, N. Y.

Hiller, Alma, Ph.D., Biological Chemistry. Associate in Chemistry, Hospital of the Rockefeller Institute for Medical Research, New York, N. Y.

Hyman, Albert Salisbury, M.D., Med.Sc.D., Zgn.Med. (Vienna), Cardiovascular Disease. Cardiologist, New York City Hospital, Beth David Hospital, Jewish Memorial Hospital; Consulting Cardiologist, Richmond Memorial Hospital, Yonkers Hospital; Director, Witkin Foundation for the Study and Prevention of Heart Disease, New York, N. Y.; Captain, Medical Corps, U. S. Naval Reserve.

Johnston, Elizabeth (degrees not received). Bacteriologist, Long Island College of Medicine, Brooklyn, N. Y.

Karrh, John H., B.S., Biology and Chemistry. Plant Manager, Butadiene Division, Publicker Industries, Inc., Philadelphia, Pa.

Kennard, Margaret A., M.D. Assistant Professor in Physiology, New York University School of Medicine, New York, N. Y.

Kirby, George W., B.Ch.E., Food Chemistry. Tech. Director, The Fleischmann Laboratories, Standard Brands, Inc., New York, N. Y.

Kupferberg, Alfred Ballen, M.S. Research Associate in Microphysiology, Ortho Research Foundation, Linden, N. J.

Labarre, Jules, L.Sc., D.Sc. (Paris, France), Biochemistry—Proteins and Amino Acids. Professor of Biochemistry and Pharmacodynamics, University of Montreal; Technical Director, Desbergers-Bismol Laboratories, Montreal, Canada.

Laning, Stephen H., B.S., Physical Chemistry, Biochemistry. Instructor, Chemistry, Rutgers University, New Brunswick, N. J.

Litchfield, John T., Jr., M.D. Pharmacologist, Stamford Laboratories, American Cyanamid Company, Stamford, Conn.

McLeod, Charlotte Pope, D.Sc. Associate Bacteriologist, U.S.P.H.S., U. S. Marine Hospital, Staten Island, N. Y.

Middlebrook, Gardner, M.D., Medicine, Bacteriology, Tuberculosis. Assistant, Rockefeller Institute, New York, N. Y.

Miller, Wilbur H., Ph.D. Research Chemist, American Cyanamid Company, Stamford, Conn.

Murray, T. J., M.Sc. Chairman Department of Bacteriology, Rutgers University, New Brunswick, N. J.

Mushett, Charles W., Ph.D. Acting Head of Pathology Department, Merck Institute for Therapeutic Research, Rahway, N. J.

Neenan, Honor, B.A. Chemistry, Science Literature. Chemistry Research Science Literature, Philips Laboratories, Irvington, N. Y.

Neuwirth, Isaac, Ph.D., Chemistry, Biology. Associate Professor, Pharmacology and Therapeutics, New York University College of Dentistry, New York, N. Y.

Newell, Norman D., Ph.D., Paleontology (Invert.) and Historical Geology. Professor of Geology, Columbia University; Curator, Geology and Paleontology, American Museum of Natural History, New York, N. Y.

Niedercorn, Joseph G., Antibiotics. Research Chemist, Lederle Laboratories, Pearl River, N. Y.

Pappas, Anne B., B.A., Biochemistry. Junior Chemist, Venereal Disease Research Laboratory, U. S. Marine Hospital, Staten Island, N. Y.

Paul, Andrew B., M.D., Medicine, Allergy. Chief, Medical Clinic, Reconstruction Unit, Postgraduate Medical School and Hospital, Columbia University, New York, N. Y.

Perlman, Ely, M.D., Immunochemistry, Protein Chemistry. Research Fellow, Rockefeller Institute, New York.

Phillips, Robert Allan, M.D., Physiology and Biochemistry. Fellow, Rockefeller Institute for Medical Research, New York, N. Y.

Portnoy, Joseph, M.S., Immunology, Chemistry. Associate Serologist, V. D. Research Laboratory, U. S. Marine Hospital, Staten Island, N. Y.

Rhodes, Robert Clinton, Ph.D., Protozoology, Parasitology, Human Genetics, Eugenics. Professor of Biology and Chairman of Department, Emory University, Ga.

Roberts, Sidney, Ph.D., Endocrinology. Research Associate, Worcester Foundation for Experimental Biology, Shrewsbury, Mass.

Robins, Jack, B.S., Analytical Chemistry. Chemist, Vanadium Corp. of America, Niagara Falls, N. Y.

Roepke, Raymond R., Ph.D., Bacterial Mutation and Metabolism, Chemotherapy. Research Biochemist, American Cyanamid Company, Stamford, Conn.

Russo, Vincent J., B.S., Inorganic Chemistry. Research Associate, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Schachfel, Ernest G., LL.D., Psychology (Psychological Tests). New School for Social Research, New York, N. Y.

Scheinberg, Herbert, M.D., Physical Chemistry, Internal Medicine. Medical Division, Edgewood Arsenal, Md.

Schwimmer, David, M.D., M.Med.Sc., Medicine—Metabolism and Nutrition. Associate, New York Medical College, Metropolitan Hospital Research Unit, New York, N. Y.

Seeley, Robert D., Ph.D., Biology, Protein Metabolism. Research Associate and Instructor, Rutgers University, New Brunswick, N. J.

Shanes, A. W., Ph.D., Biophysics, Cellular Physiology, Electrolytes, Potentials. Assistant Professor of Physiology, New York University College of Dentistry, New York, N. Y.

Shemin, David, Ph.D., Biochemistry, Protein and Amino Acid Metabolism. Associate in Biochemistry, Columbia University, New York, N. Y.

Sober, Herbert A., Ph.D., Biochemistry, Physiology. Research Assistant in Gastro-Enterology, Mt. Sinai Hospital, New York, N. Y.

Sondern, Clarence W., Ph.D., Pharmaceuticals. Director, White Laboratories, Newark, N. J.

Spaney, Emma, M.S., Statistical Methods—Educational Research. Statistician, Committee on Measurement and Educational Guidance, New York, N. Y.

Stansly, Philip G., Ph.D., Microbiology, Biochemistry. Research Biochemist, American Cyanamid Company, Stamford, Conn.

Stebbins, Robert Benedict, M.S., Antibiotics, Pathology, Endocrines. Assistant to Head of Pathology Department, Merck Institute for Therapeutic Research, Rahway, N. J.

Stone, Florence M., Ph.D. Department of Bacteriology, Long Island College of Medicine, Brooklyn, N. Y.

Szego, Clara M., Ph.D., Endocrine Physiology. Research Associate, Worcester Foundation for Experimental Biology, Shrewsbury, Mass.

Tabenkin, Benjamin, M.A., Biochemistry of Microorganisms. Research Chemist, Hoffman-La Roche, Inc., Nutley, N. J.

Thayer, James D., Ph.D. Chief Bacteriologist, V. D. Research Laboratory, U. S. Marine Hospital, Staten Island, N. Y.

Ungerleider, Harry E., M.D., Internal Medicine, Cardiology. Associate Medical Director, Equitable Life Insurance Company, New York, N. Y.

Van Burkalow, Anastasia, Ph.D., Geomorphology. Instructor, Department of Geology, Hunter College, New York, N. Y.

Vaughan, James R., Jr., Ph.D., Organic and Medicinal Chemistry. Research Chemist, American Cyanamid Company, Stamford, Conn.

Weil, Alfred Julius, M.D., Bacteriology and Immunology. Research Immunologist, Lederle Laboratories, Pearl River, N. Y.

Weill, Carol Edwin, Ph.D., Chemistry—Enzymes. Research Chemist, Takamine Laboratory, Inc., Clifton, N. J.

White, Harold J., Sc.D., Chemotherapy. Bacteriologist, Chemotherapy Division, American Cyanamid Company, Stamford, Conn.

Williams, E. Clifford, D.Sc. (London), Chemistry, Physics, Biology. Vice-President and Director of Research, Schenley Corporation, New York, N. Y.

Wooley, D. Wayne, Ph.D., Biochemistry. Associate, Rockefeller Institute for Medical Research, New York, N. Y.

ASSOCIATE MEMBERSHIP

Baxter, James G., Ph.D., Organic and Biochemistry. Supervisor, Organic Research, Distillation Products, Inc., Rochester, N. Y.

Boehme, Werner Richard, B.S., Organic and Biochemistry. Formerly Organic Research Chemist, Winthrop Chemical Company, Rensselaer, N. Y., now Pharmacist's Mate 2/c, USNR.

Collier, Charles Vines, Jr., B.S. Research Biochemist, Biochemical Research Foundation, Newark, Del.

Elisberg, Bennett L., B.A., Bacteriology. Graduate Assistant, Tulane University, School of Medicine, New Orleans, La.

Elsasser, Walter M., Ph.D., Physics, Meteorology, Electronics. RCA Laboratories, Princeton, N. J.

Harfenist, Morton, B.S., Organic Chemistry. Formerly Research Chemist, Burroughs-Wellcome & Company, Tuckahoe, N. Y., now Pharmacist's Mate 2/c, USNR.

Kahan, Ira Howard, B.S., Biology. Student, Veterinary School, University of Pennsylvania, Philadelphia, Pa.

Losee, Kathryn, B.S., Synthetic Organic Chemistry. Assistant, Squibb Institute for Medical Research, New Brunswick, N. J.

Nyman, Melvin A., B.S., Organic Chemistry. Associate Chemist, Squibb Institute for Medical Research, New Brunswick, N. J.

Robeson, Charles D., B.S., Organic and Biological Chemistry. Chemist, Organic Research Distillation Products, Inc., Rochester, N. Y.

Shantz, Edgar M., Organic and Biochemistry (oil-soluble vitamins). Research Chemist, Biological Department, Distillation Products, Inc., Rochester, N. Y.

Smith, R. Dale, Ph.D., Endocrinology. Assistant Professor of Anatomy, School of Medicine, University of Maryland, Baltimore, Md.

Stearns, Barbara, M.S., Synthetic Organic and Medicinal Chemistry. Research Assistant, Squibb Institute for Medical Research, New Brunswick, N. J.

Stone, Frederick Logan, M.S., Ichthyology. Technical Assistant, University of Rochester, Rochester, N. Y.

Swart, E. Augustus, Ph.D., Organic Chemistry. Research Associate, Squibb Institute for Medical Research, New Brunswick, N. J.

Wessel, Bessie Bloom, Ph.D., Anthropology. Chairman, Department of Social Anthropology, Connecticut College, New London, Conn.

Wiley, Ralph M., B.S., High Polymers. Assistant Superintendent, Saran Development Laboratory, Dow Chemical Company, Midland, Mich.

STUDENT MEMBERSHIP

Carr, Leatrice, Biology. Student, College of New Rochelle, New Rochelle, N. Y.
Del Torto, Mary Grace, Chemistry. Student, College of New Rochelle, N. Y.
Graf, Donald L., Geol. Engr., Mineralogy-Economic Geology. Assistant, Department of Geology, Columbia University, New York, N. Y.
Knox, Margaret S., A.B., Mineralogy. Student and Research Assistant, Department of Geology, Columbia University, New York, N. Y.
Mehler, Alan H., A.B., Biochemistry. Graduate Student, Department of Chemistry, New York University College of Medicine, New York, N. Y.
O'Brien, James Joseph, B.A. Assistant in Geology, Department of Geology, Columbia University, New York, N. Y.